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## ABSTRACTS

**Mara Andrione[1], Marco Paoli[2], Elisa Rigosi[2], Gianfranco Anfora[3], Giorgio Vallortigara[1], Renzo Antolini[1,2], and Albrecht Haase[1,2]**

*[1]CIMeC, Centre for Mind/Brain Sciences, University of Trento, Rovereto, Italy; [2]BIOtech center and Department of Physics, University of Trento, Trento, Italy; [3]IASMA center, Fondazione E. Mach, San Michele, Italy*

**Imaging plasticity in the honeybee antennal lobe**

The olfactory system of the honeybee, Apis mellifera, is a well-established model for studying the anatomical bases of odor coding and olfactory memory. The bee primary olfactory centers, the antennal lobes (ALs), are organized in a fixed arrangement of spheroidal neuropil units, the glomeruli. These structures receive inputs from the bee olfactory receptor neurons (ORNs), are modulated by local interneurons (LINs), and send outputs to higher brain centers through the projection neurons (PNs). The spatio-temporal pattern of activation of the glomeruli is odor-specific, thus, imaging of intracellular calcium of the PNs may provide maps of odor representation. Such maps have been demonstrated to vary upon olfactory conditioning (i.e. through enhancement of the discrimination of a rewarded odor against an unrewarded one), but the underlying mechanisms for this plasticity are not known. The aim of this study is to investigate plastic changes following odor conditioning and, in particular, possible variations in number and morphology of the synapses involved in the ALs circuitry.

**Marco Paoli, Elisa Rigosi, Mara Andrione, Gianfranco Anfora, Giorgio Vallortigara, Renzo Antolini, Albrecht Haase**

*University of Trento, Italy*

**In vivo morpho-functional imaging of the honeybee antennal lobes**

The western honeybee Apis mellifera, with a medium-sized brain of about a million neurons, was chosen as a model to study olfactory information coding and associative memory related plasticity. We focused our attention on the primary olfactory neurophils, the antennal lobes (ALs), responsible for coding and processing the sensory information received by the olfactory receptor neurons and for delivering the encoded signals to the mushroom bodies through the projection neurons. A multiphoton microscopy set-up allowed in vivo calcium imaging recording of the antennal lobes at milliseconds resolution. Functional calcium imaging permits recording of the odour stimuli response maps of the functional units, the glomeruli. Moreover, due to the high penetration depth of the set-up, these maps, representing the spatial odour code, can now be extended to sub-surface glomeruli, so far inaccessible to functional imaging. Finally, the penetration depth of multiphoton microscopy coupled with optical clearing treatment permits high-resolution 3D reconstruction of the whole neurophil and this will allow investigating at the cellular level the morphological changes in the glomeruli associated with olfactory memory formation.

**Marianna Zhukovskaya, Wada-Katsumata A. and Schal, C.**

*Sechenov Institute of Evolutionary Physiology and Biochemistry, Russian Academy of Sciences, Russia*

**Grooming as a non-specific mechanism of odorant-elimination**

Odorant molecules adsorbed by the sensillar and antennal cuticle likely migrate towards the sensillar pores (Kanaujia and Kaissling, 1985; Maitani et al., 2010) and approach receptor cells long after the